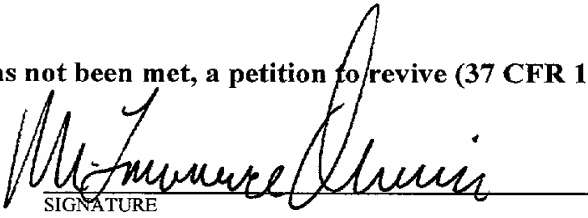


FORM PTO-1390 TRADEMARK OFFICE (REV. 1094) TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		ATTORNEY'S DOCKET NUMBER P0557/7030 U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/581978
INTERNATIONAL APPLICATION NO. PCT/AU98/01070	INTERNATIONAL FILING DATE 22 December 1998 (22.12.98)	PRIORITY DATE CLAIMED 1 July 1999 (01.07.99)
TITLE OF INVENTION MANUFACTURE OF FOOTWEAR		
APPLICANT(S) FOR DO/EO/US MACLEOD, Norman William		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This express request to begin national procedures (35 U.S.C. 371(f) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)). <ol style="list-style-type: none"> a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(C)(5)). 		
Items 11. To 16. Below concern document(s) or information included:		
<ol style="list-style-type: none"> 11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment (with amended, claims). <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input type="checkbox"/> A substitute specification (submitted as a first Preliminary Amendment). 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input checked="" type="checkbox"/> Other items or information: Mailed via Express Mailing Label No. EM529190415US Published Application PCT/AU98/01070 with Search Report Post Card 		
Express Mail Label No. EM529190415US MAILING DATE: JUNE 20, 2000		

U.S. APPLICATION NO (If known, see 37 CFR 1.5) <div style="font-size: 2em; font-weight: bold; margin-top: 10px;">09/581978</div>		INTERNATIONAL APPLICATION PCT/AU98/01070		ATTORNEY'S DOCKET NUMBER P0557/7030	
17. <input checked="" type="checkbox"/> The following fees are submitted:				CALCULATIONS <small>PTO USE ONLY</small>	
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):					
Search Report has been prepared by the EPO or JPO				\$840.00	
International preliminary examination fee paid to USPTO (37 CFR 1.482)				\$670.00	
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))..				\$760.00	
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....				\$970.00	
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)				\$96.00	
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$ 840.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than ~ 20 X 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	20 - = 20		X \$18.00	\$	
Independent Claims	3- = 3	0	X \$78.00	\$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+\$260.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$840.00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				\$	
SUBTOTAL =				\$420.00	
Processing fee of \$130.00 for furnishing the English translation later than ~ 20 ~ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$420.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate coversheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$	
TOTAL FEES ENCLOSED =				\$420.00	
				Amount to be:	
				refunded	\$
				charged	\$
<p>a. A check in the amount of \$ to cover the above fees is enclosed.</p> <p>b. <input checked="" type="checkbox"/> Please charge by Deposit Account No. 23/2825. In the amount of \$420.00 To cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 23/2825. A duplicate of this sheet is enclosed.</p> <p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p> <div style="display: flex; justify-content: space-between; align-items: flex-end; margin-top: 20px;"> <div style="width: 45%;"> <p>SEND ALL CORRESPONDENCE TO</p> <p>Therese A. Hendricks WOLF, GREENFIELD & SACKS, P.C. 600 Atlantic Avenue Boston, Massachusetts 02210</p> </div> <div style="width: 45%; text-align: center;"> <div style="font-size: 1.5em; margin-bottom: 10px;">  </div> <p>SIGNATURE</p> <p>M. Lawrence Oliverio</p> <hr style="width: 100%;"/> <p>NAME</p> <p>30,915</p> <hr style="width: 100%;"/> <p>REGISTRATION NO</p> </div> </div>					

430 Rec'd PCT/PTO 20 JUN 2000

FORM PTO-1390 TRADEMARK OFFICE (REV. 1094) TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		ATTORNEY'S DOCKET NUMBER P0557/7030 U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/581978
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COPY



Attorney's Docket No. P0557/7030

Applicant or Patentee: Norman William MacLeod
Serial or Patent No: 09/581,978
Filed or Issued: June 20, 2000
For: MANUFACTURE OF FOOTWEAR

**DECLARATION CLAIMING SMALL ENTITY STATUS
(INDEPENDENT INVENTOR)**

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled described in

- ☐ the specification filed herewith
☒ application serial no. 09/581,978 filed June 20, 2000
☐ patent no. _____, issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who would not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☒ no such person, concern, or organization
☐ persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

FULL NAME


ADDRESS

☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Norman William MacLeod

NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
		
SIGNATURE OF INVENTOR	SIGNATURE OF INVENTOR	SIGNATURE OF INVENTOR
1-8-2000		
DATE	DATE	DATE

ATTORNEY'S DOCKET NO: P0557/7030

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Norman William MACLEOD
Serial No: --
Filed: Herewith
For: MANUFACTURE OF FOOTWEAR

Assistant Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Before examination, please amend the above application as follows:

In The Claims

Please delete claims 1-21.

Please insert the following claims 22-41:

-- 22. A method of making an item of footwear -such as a shoe or a boot, including the steps of:

forming an upper for the item of footwear on a forming last, the forming last including a body having the general shape of a foot around which the upper of the footwear item is to be formed, the body having a base corresponding to a sole of the foot shape; and

moulding a rubber sole onto the formed upper while it is still mounted on the forming last, the forming last being heated before and/or during the moulding step,

wherein the step of heating the forming last includes heating the base of the last body, whilst substantially preventing the heating of parts of the body other than the base.

23 A method as claimed in claim 22, wherein the step of moulding the rubber sole includes:

placing the last with the upper thereon adjacent a mould assembly having a plurality of mould parts;

arranging the mould parts adjacent the base of the last and the upper thereon to define a mould cavity for the rubber sole;

injecting rubber into the cavity; and

applying heat and pressure to the rubber in the cavity to form the sole in adherence with the upper.

24. A method as claimed in claim 23, including the step of heating the mould parts before and/or during formation of the rubber sole to vulcanise the rubber.

25. An apparatus for making an item of footwear such as a shoe or a boot, including:

a forming last including a body mimicking the general shape of a foot around which an upper of the item of footwear is to be formed, the body having a base corresponding to a sole of the foot shape; and

means for moulding a rubber sole onto a formed upper while it is still mounted on the forming last;

the apparatus including means for heating the base of the body of the forming last, and including means for substantially preventing the heating of parts of the body other than the base.

26. An apparatus as claimed in claim 25, wherein the means for heating the base is located within the last.

27. An apparatus as claimed in claim 25, wherein the base includes a metallic portion to which heat is transmissible from the heating means.

28. An apparatus as claimed in claim 27, wherein the metallic portion includes at least one metal plate member which extends over the base of the last body and wherein the heating means includes at least one electrically activated heating element located inside the last adjacent an inner side of said at least one plate member.

29. An apparatus as claimed in claim 25 wherein the means for moulding the rubber sole includes a mould assembly having:

a plurality of mould parts to be arranged adjacent the base of the last and the upper of the footwear item formed thereon to define a mould cavity for the rubber sole; and

an injector for injecting a rubber mixture into the mould cavity.

30. An apparatus as claimed in claim 29, wherein the moulding means includes means for compressing the rubber received within the mould cavity and means for heating the mould parts to vulcanise the rubber in the mould cavity.

31. A last for making an item of footwear such as a shoe or a boot, including a body mimicking the general shape of a foot around which an upper of the item of footwear is to be formed, the body having a base corresponding to a sole of the foot shape and the last further including means for heating the base of the last body and means for substantially preventing the heating of parts of the body other than the base.

32. A last as claimed in claim 31, the means for substantially preventing the heating of parts of the body other than the base comprising insulation means between the base and the rest of the body.

33. A last as claimed in claim 31, wherein the means for heating the base is located within the last.

34. A last as claimed in claim 31, wherein the base includes a metallic portion to which heat is transmissible from the heating means.

35. A last as claimed in claim 34, wherein the metallic portion includes at least one metal plate member which extends at least partially over the base of the body member.

36. A last as claimed in claim 35, wherein the heating means includes at least one electrically activated heating element located inside the last adjacent an inner surface of said at least one plate member.

37. A last as claimed in claim 36, wherein the last body includes a recess or cavity for receiving and housing said at least one electrically activated heating element adjacent said at least one plate member, the said insulation means serving to insulate parts of the body other than the base from heat generated by the at least one heating element.

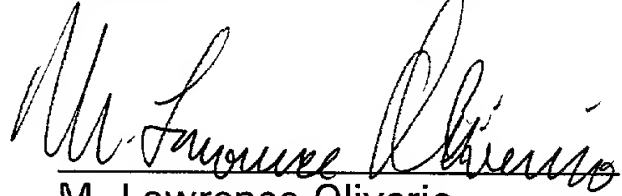
38. A last as claimed in claim 37, wherein the insulating means includes a layer of thermal insulation material located between the at least one heating element and non-metallic parts of the last body.

39. A last as claimed in claim 31 wherein the last body includes a heel portion and a toe portion, the heel portion and the toe portion being separable from one another to facilitate removal of a finished item of footwear from the last.

40. A last as claimed in claim 31 wherein the last body is made at least partially from plastic.

41. A last as claimed in claim 40 wherein the last body is made predominantly from plastic, such as polyethylene. --

Respectfully Submitted,



M. Lawrence Oliverio

Reg. No. 30,915

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Boston, MA 02210-2211

(617)720-3500

Date: June 20, 2000
Docket No. P0557/7030

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09/581978
430 Rec'd PCT/PTO 20 JUN 2000

WO 99/32276

PCT/AU98/01070

1

MANUFACTURE OF FOOTWEAR

Technical Field

The present invention relates to the manufacture of footwear. More
5 specifically this invention relates to the moulding of a sole onto the formed
upper of an item of footwear such as a shoe or boot.

Background Art

10 Many boots and shoes have an upper formed from a flexible sheet
material such as imitation leather or real leather, with a base of the upper
mounted on a sole moulded from a polymer plastic or rubber material. The use
of synthetic materials in the manufacture of soles for boots and shoes is
15 already well established. PVC, polyurethane, EVA and thermoplastic rubber
have all been used to fulfil this purpose. These synthetic materials have
suitable functional properties and are aesthetically pleasing as well as being
comfortable. Rubber, however, is particularly sought after because of its
durability, its resistance to hydrolysis and bacterial attack and its thermal
resistance.

20

During the production process the upper is typically formed around a
forming last in a first manufacturing step and then the sole is injection moulded
onto a base of the upper in a second manufacturing step. The forming last
provides a template for the three-dimensional size and shape of the upper.
25 Accordingly, the first step involves mainly shaping and stitching operations. As
there is generally no heating involved in this step the last can be made from a
variety of different materials. Wood and metal have traditionally been used,
and more recently plastic. Plastic is particularly preferred in lasts today
because it is easy to form into the desired shape and is also relatively
30 inexpensive.

The second manufacturing step of the production process involves the injection moulding of the sole onto the base of the upper. As mentioned above, several synthetic materials have been known to be used for the sole. Rubber, however, is seen as being particularly attractive and so-called twin density rubber soles are particularly desirable because they provide a tough out-sole and a resilient mid-sole. Twin density rubber soles therefore provide a durable wear surface at the outsole while maintaining cushioned comfort for the wearer with the resilient mid-sole. Expanded vulcanised rubber in the mid-sole contains cavities or cells (either open or closed) which give the mid-sole its desired level of resilience.

The moulding of rubber soles is an endothermic process and it is therefore necessary to supply generous amounts of heat to the mould. That is, the parts of a mould for a rubber sole must be heated to the appropriate moulding temperature as the sole is being formed. Because of this necessity to supply heat to the mould, the production process for such rubber-soled footwear has up to now required labour-intensive transfer of the formed upper from the forming last to an injection moulding assembly at which the second manufacturing step could take place. That is, after the first step during which the upper is formed by shaping and stitching on the forming last, the upper is physically transferred from the forming last to a second heated last at the moulding assembly.

This intermediate step of transferring the upper from the forming last to the injection moulding assembly, however, has the disadvantage that it is very labour intensive and can easily add 25% to the manufacturing cost for a pair of shoes. A further disadvantage is that mistakes can occur when placing a lasted shoe on the injection moulding assembly. That is, pre-roughened and/or pre-cemented uppers may be incorrectly placed or aligned, potentially causing a problem with the bonding of the sole to the upper. Not only may this create an unsatisfactory product but it may also delay production while the problem is rectified.

It would therefore be highly desirable to provide a means of integrating the production process steps of forming the upper on the last and moulding the sole onto the upper. This would clearly streamline the production process and reduce the production costs.

5

Summary of the Invention

According to an aspect of the present invention there is provided a method of making an item of footwear such as a shoe or a boot, including the steps of:

forming an upper for the item of footwear on a forming last, the forming last including a body having the general shape of a foot around which the upper of the footwear item is to be formed, the body having a base corresponding to a sole of the foot shape; and

moulding a rubber sole onto the formed upper while it is still mounted on the forming last, the forming last being heated before and/or during the moulding step,

wherein the step of heating the forming last includes heating the base of the last body, whilst substantially preventing the heating of parts of the body other than the base.

Thus, the upper remains mounted on a single last for the entire process, including for the moulding and vulcanisation of the rubber sole on the upper.

As already mentioned, the moulding of rubber is an endothermic process. Therefore, in a preferred form of the present invention the method includes the step of heating the forming last before and/or during the step of moulding the rubber sole onto the formed upper. The forming last typically includes a body mimicking the general shape of a foot, around which body the upper of the item of footwear is formed. Furthermore, the body typically has a base corresponding to a sole of the foot shape. In a preferred form of the

invention the step of heating the forming last includes heating the base of the last body.

Desirably, the step of heating the forming last before and/or during the
5 moulding step is by means of a heating device located within the last body. Alternatively, the heating means may be in the form of a radiant heater spaced away from the last.

In a preferred form of the present invention the step of moulding the
10 rubber sole includes:

placing the last with the upper thereon adjacent a mould assembly having a plurality of mould parts;

arranging the mould parts adjacent the base of the last and the upper thereon to define a mould cavity for the rubber sole;

15 injecting rubber into the cavity; and

applying heat and pressure to the rubber in the cavity to form the sole in adherence with the upper.

The heat may be applied to the rubber in the cavity by the step of
20 heating the last as well as by heating the plurality of mould parts which define the mould cavity for the rubber sole. Naturally, the moulding of the rubber sole includes this application of heat and pressure to the rubber mixture in order to vulcanise the rubber. The step of moulding the sole may also include a two-step moulding process for producing a twin density rubber sole including a
25 relatively compact rubber out-sole and an expanded rubber mid-sole.

It is to be appreciated that the present invention also extends to an item of footwear made in accordance with the method described above.

30 According to another aspect of the present invention there is provided an apparatus for making an item of footwear such as a shoe or a boot, including:

4a

a forming last including a body mimicking the general shape of a foot around which an upper of the item of footwear is to be formed, the body having a base corresponding to a sole of the foot shape; and

means for moulding a rubber sole onto a formed upper while it is still
5 mounted on the forming last;

the apparatus including means for heating the base of the body of the forming last, and including means for substantially preventing the heating of parts of the body other than the base.

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Thus, with the apparatus of the invention it is not necessary to take the shoe or boot upper off the last on which it is formed before the rubber sole can be moulded onto the upper. Rather, the apparatus has means for supplying necessary heat to the forming last to efficaciously mould the rubber sole.

5

In a preferred form of the invention the means for heating the base of the last body is located within the last. Preferably the base of the last body includes a metallic portion such as one or more metal plate member defining an outer surface of the base to which heat is transmissible from the heating means. The heating means may include one or more electrically activated heating element located inside the last adjacent an inner side of the plate member(s).

10

In a preferred form of the invention the means for moulding the rubber sole includes:

15

a mould assembly having a plurality of mould parts to be arranged adjacent the base of the last body, and the upper located thereon, to define a mould cavity for the rubber sole; and

an injector for injecting a rubber mixture into the mould cavity.

20

The mould parts preferably comprise two side parts, a top part formed by the base of the last and a bottom part which is moveable to compress the rubber during the moulding process. As the injection moulding and vulcanisation of the rubber requires substantial heat, the mould assembly also includes means for heating the side parts and the bottom part of the mould assembly. Typically, these mould parts are heated by electric heating elements embedded therein with those mould parts desirably being formed of metal.

25

In a preferred form of the invention the apparatus also includes a dummy last in addition to the forming last(s) by means of which a compact out-sole may be formed for a two-density rubber sole. Advantageously, the apparatus of the invention also includes a support which is moveable relative to the moulding

30

means, the forming last and the dummy last being mounted on the support spaced apart from each other.

According to a further aspect of the present invention there is provided a
5 last for making an item of footwear such as a shoe or a boot, including a body
mimicking the general shape of a foot around which an upper of the item of
footwear is to be formed, the body having a base corresponding to a sole of the
foot shape and the last further including means for heating the base of the last
body, and means for substantially preventing the heating of parts of the body
10 other than the base.

In a preferred form of the invention the means for heating the base of the
last body is located within the last and is preferably in the form of one or more
electric heating element. The base of the last body may include a metallic
15 portion such as a plate member to which heat is transmissible from the heating
means. At least one electrically activated heating element may be located
inside the last adjacent an inner surface of the plate member(s). The plate
members desirably extend across the base of the last body.

20 Preferably, the means for substantially preventing the heating of parts of
the body other than the base comprising insulation means between the base
and the rest of the body.

In a preferred form of the invention the last body includes a recess or
25 cavity for receiving and housing one or more electrically activated heating
element adjacent the plate member(s). The body of the last is preferably
formed predominantly from a plastic such as polyethylene. The plate member
is preferably formed of a material having good thermal conductivity, eg a metal
such as aluminium or steel.

30

The insulation means serve to insulate parts of the body other than the base, such as the non-metallic parts of the body (in the case of a plastic body, for example) from heat generated by the heating element(s).

- Furthermore, in a preferred form of the invention the last body comprises two distinct portions; namely, a heel portion and a toe portion. The heel portion and the toe portion are separable from one another to facilitate removal of an item of footwear from the last after the sole has been moulded.

The above and further features and advantages of the present invention will be more fully appreciated from the following detailed description of preferred embodiments of the invention with reference to the accompanying drawings.

5

Brief Description of the Drawings

Fig. 1 is a three dimensional view of a rotary apparatus for making shoes in accordance with one embodiment of the invention;

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Fig. 2 is a three dimensional view of a forming last and a dummy last mounted on a last support for the apparatus of Fig. 1;

Fig. 3 is a schematic sectioned side view of the forming last of Fig. 2;

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Figs. 4i to 4iii are schematic sectioned views of part of the apparatus of Fig. 1 showing the means for injection and compression moulding of a rubber sole to a shoe upper; and

Fig. 5 shows an item of footwear made in accordance with the present invention.

Detailed Description of Preferred Embodiments of the Invention

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Referring to Fig. 1 of the drawings, the present invention provides an apparatus (1) suitable for manufacturing items of footwear such as shoes and boots having a flexible leather upper and an injection moulded rubber sole. An example of such an item of footwear which may be made with the apparatus (1) is illustrated in Fig. 5. Fig. 5 shows a shoe (2) having a leather upper (3) and a rubber sole (4) comprising an expanded rubber mid-sole 4a and a tough rubber outsole 4b.

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Returning to Fig. 1, the apparatus (1) broadly includes a plurality of lasts (5) mounted in spaced apart relation around the periphery of a turntable (6). A number of stationary workstations (7) complementary to the number of lasts (5) are positioned radially outward of and adjacent to the turntable (6). The lasts

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(5) move with the turntable sequentially through each of the workstations (7) as the turntable (6) is rotated. A shoe (2) is progressively formed in discrete fabrication steps on each last (5) as the lasts move sequentially through the separate workstations (7).

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With reference to Fig. 3 of the drawings, each last (5) includes a body (8) which mimicks or has the general shape of a foot and provides a template for the shape and size of a particular style shoe; in particular, the upper portion (3) of the shoe. The body (8) of each forming last is formed predominantly of polyethylene since this material is relatively inexpensive and can be readily shaped to a specific last design. The last body (8) has a base (9) which corresponds to a sole of the foot shape that the last body is designed to mimick.

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The body (8) of each last (5) includes two discrete parts, namely a heel portion (10) and a toe portion (11) which are separably attached end-to-end along a junction (12) when the last is mounted on the turntable. The base (9) of the last body includes plate members (13,14) which extend over the base in each of the heel and toe portions (10,11) of the last body, respectively. The plate members (13,14) are preferably formed from aluminium which has good thermal conductivity properties. Other metals, however, may be equally suitable. The plate members (13,14) present the outer surface at the base of the last and may be attached to the last body by any suitable fastening, such as screws (27).

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The last body (8) also includes a recess (15) for receiving and housing an electrically activated heating element (16) adjacent an inner surface of each of the heel and toe portion base plate members (13,14). The heating elements (16) are in face-to-face contact with the plate members over a substantial proportion of the surface area of those plate members thereby providing direct and effective heat conduction in a substantially uniform manner over the plate members. The recess (15) also includes insulation material (17) provided on

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the side of the electric heating elements opposite the base plate members (13,14) to thermally shield the polyethylene parts of the heel and toe portions (10,11) from the heat generated by the heating elements. During the moulding of the rubber sole (4) the base plates (13,14) of the forming last are heated in the range of about 100°C to 120°C, and the heating elements (16) themselves achieve temperatures even higher. The non-metallic parts of the last body must therefore be insulated to prevent their undesirable deformation.

Each of the electric heating elements (16) is electrically connected to an electric power supply. Electric wires or leads (18) extend from each of the elements (16) to terminals (19) at a top surface of the last (5). These terminals (19) are adapted to operate in a male-female bayonet type coupling for connection to the power supply (not shown). When each last (5) is mounted onto the rotatable turntable (6) of the apparatus (1) shown in Fig. 1 the terminals engage in a bayonet type coupling to connect the heating elements to a power supply which will heat the base plate members to appropriate temperature. Each last (5) also includes a thermostat (not shown) to monitor and regulate heating of the plate members (13,14).

The formation or manufacture of an upper (3) for an item of footwear typically involves cutting, shaping and stitching of a flexible material, such as real or imitation leather, around the body (8) of the forming last (5). The formation of the upper (3) takes place predominantly at room temperature and occurs throughout a series of separate operations at several work stations. Once the shoe upper (3) is completed, the last (5) with the formed upper thereon, is moved to a workstation (20) specifically designed for injection moulding of a rubber sole (4) onto the upper.

Referring to Figs 4i to 4iii, the apparatus (1) at the workstation (20) includes a mould assembly (21) having a plurality of mould parts to be arranged adjacent the base of the last (5) - with the upper (3) of the footwear item formed thereon - to define a mould cavity (22) for the rubber sole (4) and an injector

(23) for injecting a rubber mixture into the cavity. The structure and function and the injector is known and will therefore not be described in further detail here. The plurality of mould parts include two side mould parts (24) and a bottom part (25). During the moulding process the base of the last body (18) forms a top part of the mould. The bottom part of the mould is operatively attached to a ram (26) which is moveable upwardly into engagement with the rubber mixture during the moulding process to compress it and promote vulcanisation. Typically the ram (26) is hydraulically driven although obviously other means may also be used.

As the vulcanisation of the rubber during the moulding process requires the input of a substantial amount of heat, each of the mould parts (24,25) is heated. The mould parts may be heated by means of electrical heating elements embedded within the mould parts themselves. The mould parts (24, 25) are typically formed of metal to conduct heat to the rubber mixture during the moulding process. It will be appreciated, however, that the mould parts may also be heated by other means.

The sole (4) of the shoe is formed from a rubber mix material which is typically obtained from a specialist rubber supply company. The rubber mix comprises a basic polymer material which is irreversibly transformed from a plastic to an elastic state by a process of vulcanisation. The vulcanisation of the basic polymer material essentially involves three-dimensional cross-linking of the polymer molecules. Vulcanisation is accomplished under specific conditions of elevated temperature and pressure. The rubber mix also includes basic polymer additives including fillers and protective agents.

During the moulding process an appropriate quantity of rubber mix is injected into the mould cavity (22). In the illustrated embodiment the injector (23) actually projects into the cavity and is then withdrawn as the rubber mix material is dispensed. It will be appreciated, however, that other techniques and arrangements can be used. Preferably before the moulding process has

5 begun, the heating elements (16) within the last (5) have been heating the base plate members (13,14) of the last body to the appropriate temperature for moulding the sole. A thermostat operatively associated with the plate members (13,14) maintain the base (9) of the last body at the appropriate temperature throughout the moulding process. Likewise, the side and bottom mould parts (24,25) are heated before and/or during this moulding phase. Thus, after the cavity (22) is injected with the desired quantity of the rubber mix the ram (26) moves the bottom part of the mould upward against the formed upper and the heated base (9) of the last body (8). The rubber mix is therefore vulcanised under heat and pressure to form the sole (4) in adherence with the upper (3). It will be appreciated by persons skilled in the art that the formed upper (3) may undergo a pre-roughening and/or pre-cementing phase prior to the moulding process in order to promote adherence of the moulded sole to the upper.

15 After the moulding of the sole is completed the shoe (2) is moved on the forming last (5) away from the workstation (20). Removal of the shoe from the last (5) is facilitated by separation of the toe portion (11) from the heel portion (10) of the body (8) along the junction (12).

20 The sequence of steps illustrated particularly clearly in Figs. 4i to 4iii represents the manufacture of a single density sole as distinct from a two-density sole referred to earlier. One particularly useful property of rubber is that it can be used to make a two-density rubber sole. That is, a sole for having an expanded rubber mid-sole(4a) and a thin layer of compact rubber which forms an outsole(4b) in two discrete steps. The first step comprises forming the compact rubber outsole and the second step comprising forming the expanded rubber mid-sole.

30 With reference to Fig. 2 of the drawings, the process involves the use of a dummy last (28) for creating the compact rubber outsole while the forming last (5) having the shoe upper (3) thereon is used for moulding the expanded rubber mid-sole.

Each last (5) has an associated dummy last (28) mounted on a common support (29) rotatable on the turntable (6). The support (29) can be moved between a first position in which the dummy last (28) extends into the mould cavity (22) with the last (5) spaced away therefrom and directed upwardly, and a second position in which the last (5) projects into the moulding cavity (22) and the dummy last (28) points upwardly.

In the first step the outsole (4a) is moulded with the dummy last (28) in position in the mould cavity (22). In the second step the mid-sole is formed with the last (5) and the shoe upper (3) in the mould cavity. It is the second step therefore which physically attaches the sole (4) to the fabric base of the upper (3).

A major advantage of the method described above is that the lasted upper (3) does not need to be transferred from a last for forming the upper to a vulcanising last designed for the moulding process. Accordingly, the manufacturing process is substantially more streamlined, more efficient and cheaper. The end product is also arguably of superior quality. In the very competitive footwear industry, lower production cost is significant.

Finally, it is to be appreciated that various modifications, alterations and/or additions may be introduced into the construction and arrangement of the parts particularly herein described without departing from the spirit or ambit of the present invention.

CLAIMS:

1. A method of making an item of footwear such as a shoe or a boot, including the steps of:

forming an upper for the item of footwear on a forming last, the forming last including a body having the general shape of a foot around which the upper of the footwear item is to be formed, the body having a base corresponding to a sole of the foot shape; and

moulding a rubber sole onto the formed upper while it is still mounted on the forming last, the forming last being heated before and/or during the moulding step,

wherein the step of heating the forming last includes heating the base of the last body, whilst substantially preventing the heating of parts of the body other than the base.

2. A method as claimed in claim 1, wherein the step of moulding the rubber sole includes:

placing the last with the upper thereon adjacent a mould assembly having a plurality of mould parts;

arranging the mould parts adjacent the base of the last and the upper thereon to define a mould cavity for the rubber sole;

injecting rubber into the cavity; and

applying heat and pressure to the rubber in the cavity to form the sole in adherence with the upper.

3. A method as claimed in claim 2, including the step of heating the mould parts before and/or during formation of the rubber sole to vulcanise the rubber.

4. An apparatus for making an item of footwear such as a shoe or a boot, including:

a forming last including a body mimicking the general shape of a foot around which an upper of the item of footwear is to be formed, the body having a base corresponding to a sole of the foot shape; and

means for moulding a rubber sole onto a formed upper while it is still mounted on the forming last;

the apparatus including means for heating the base of the body of the forming last, and including means for substantially preventing the heating of parts of the body other than the base.

5. An apparatus as claimed in claim 4, wherein the means for heating the base is located within the last.

10 6. An apparatus as claimed in claim 4 or claim 5, wherein the base includes a metallic portion to which heat is transmissible from the heating means.

15 7. An apparatus as claimed in claim 6, wherein the metallic portion includes at least one metal plate member which extends over the base of the last body and wherein the heating means includes at least one electrically activated heating element located inside the last adjacent an inner side of said at least one plate member.

20 8. An apparatus as claimed in any one of claims 4 to 7, wherein the means for moulding the rubber sole includes a mould assembly having:

a plurality of mould parts to be arranged adjacent the base of the last and the upper of the footwear item formed thereon to define a mould cavity for the rubber sole; and

an injector for injecting a rubber mixture into the mould cavity.

25 9. An apparatus as claimed in claim 8, wherein the moulding means includes means for compressing the rubber received within the mould cavity and means for heating the mould parts to vulcanise the rubber in the mould cavity.

30 10. A last for making an item of footwear such as a shoe or a boot, including a body mimicking the general shape of a foot around which an upper of the

item of footwear is to be formed, the body having a base corresponding to a sole of the foot shape and the last further including means for heating the base of the last body and means for substantially preventing the heating of parts of the body other than the base.

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11. A last as claimed in claim 10, the means for substantially preventing the heating of parts of the body other than the base comprising insulation means between the base and the rest of the body.

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12. A last as claimed in claim 10 or claim 11, wherein the means for heating the base is located within the last.

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13. A last as claimed in any one of claims 10 to 12, wherein the base includes a metallic portion to which heat is transmissible from the heating means.

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14. A last as claimed in claim 13, wherein the metallic portion includes at least one metal plate member which extends at least partially over the base of the body member.

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15. A last as claimed in claim 14, wherein the heating means includes at least one electrically activated heating element located inside the last adjacent an inner surface of said at least one plate member.

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16. A last as claimed in claim 15 insofar as dependent on claim 11, wherein the last body includes a recess or cavity for receiving and housing said at least one electrically activated heating element adjacent said plate member(s), the said insulation means serving to insulate parts of the body other than the base from heat generated by the heating element(s).

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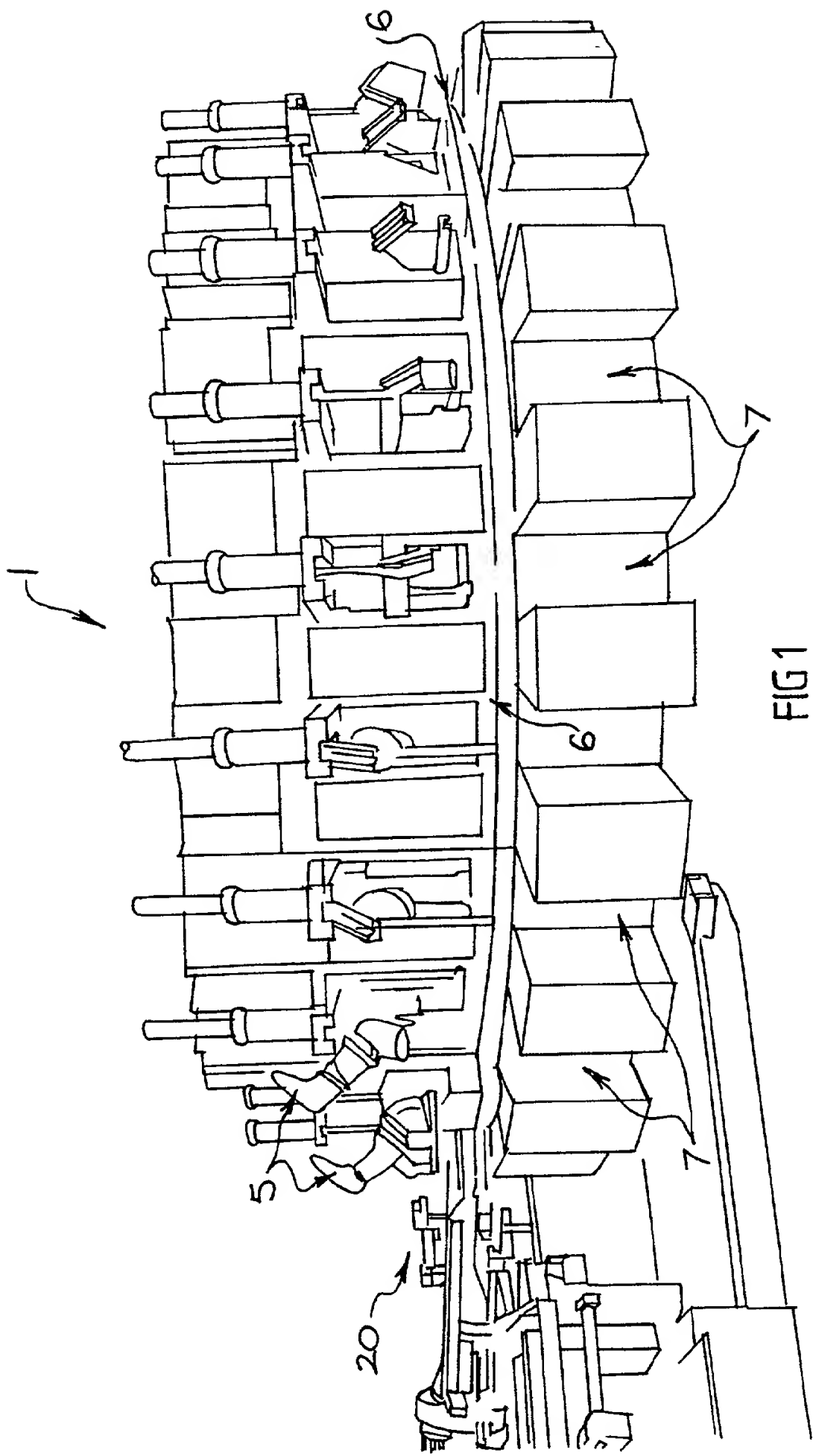
17. A last as claimed in claim 16 insofar as dependent on claim 13, wherein the insulating means includes a layer of thermal insulation material located between the heating element(s) and non-metallic parts of the last body.

5 18. A last as claimed in any one of claims 10 to 17 wherein the last body includes a heel portion and a toe portion, the heel portion and the toe portion being separable from one another to facilitate removal of a finished item of footwear from the last.

10 19. A last as claimed in any one of claims 10 to 18 wherein the last body is made at least partially from plastic.

20. A last as claimed in claim 19 wherein the last body is made predominantly from plastic, such as polyethylene.

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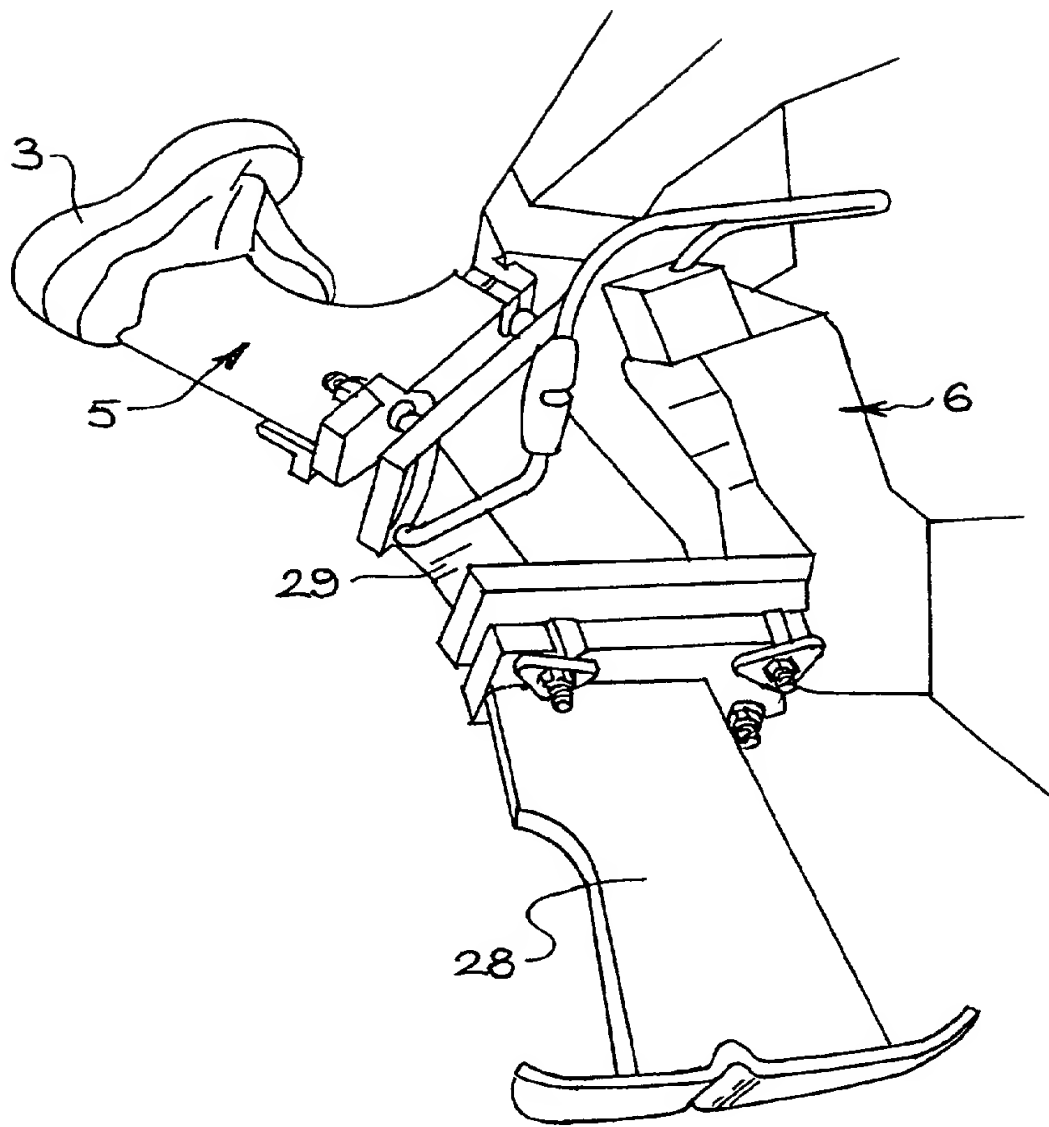


FIG 2

[illegible]

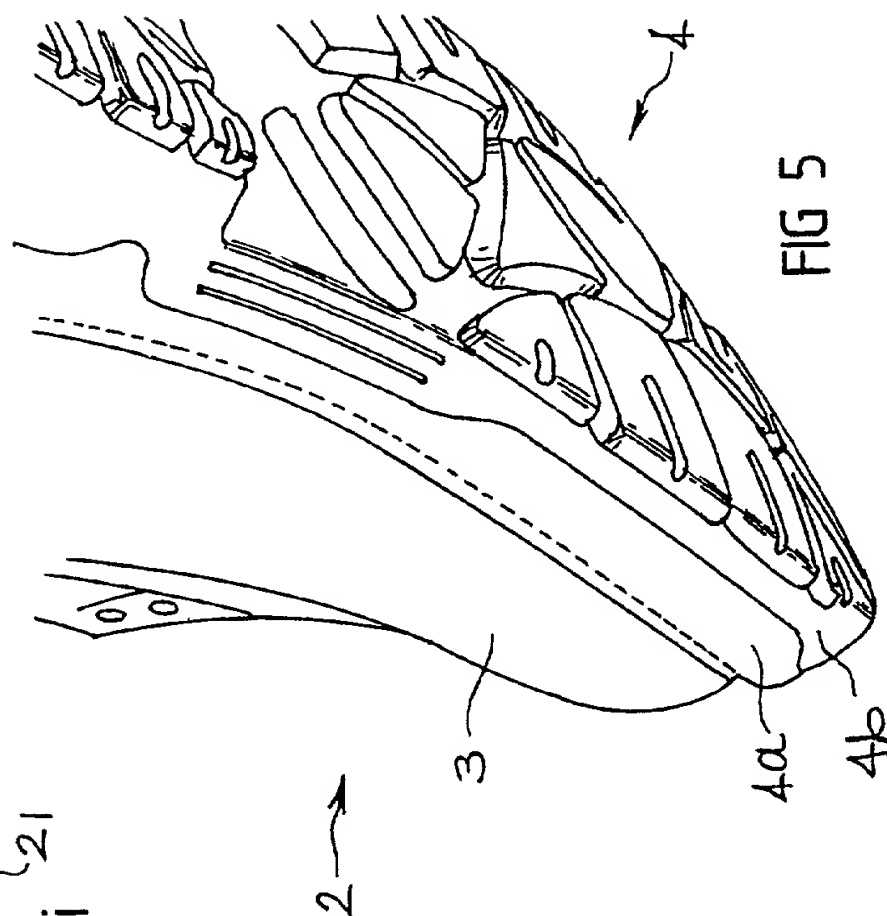
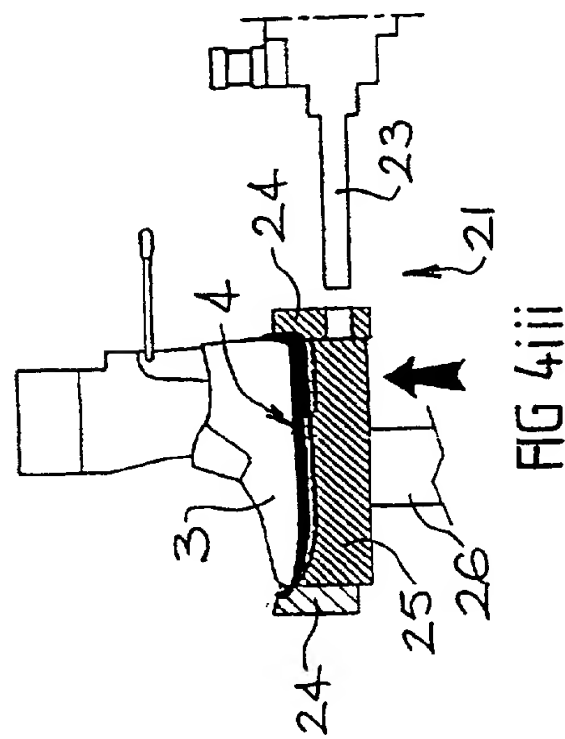
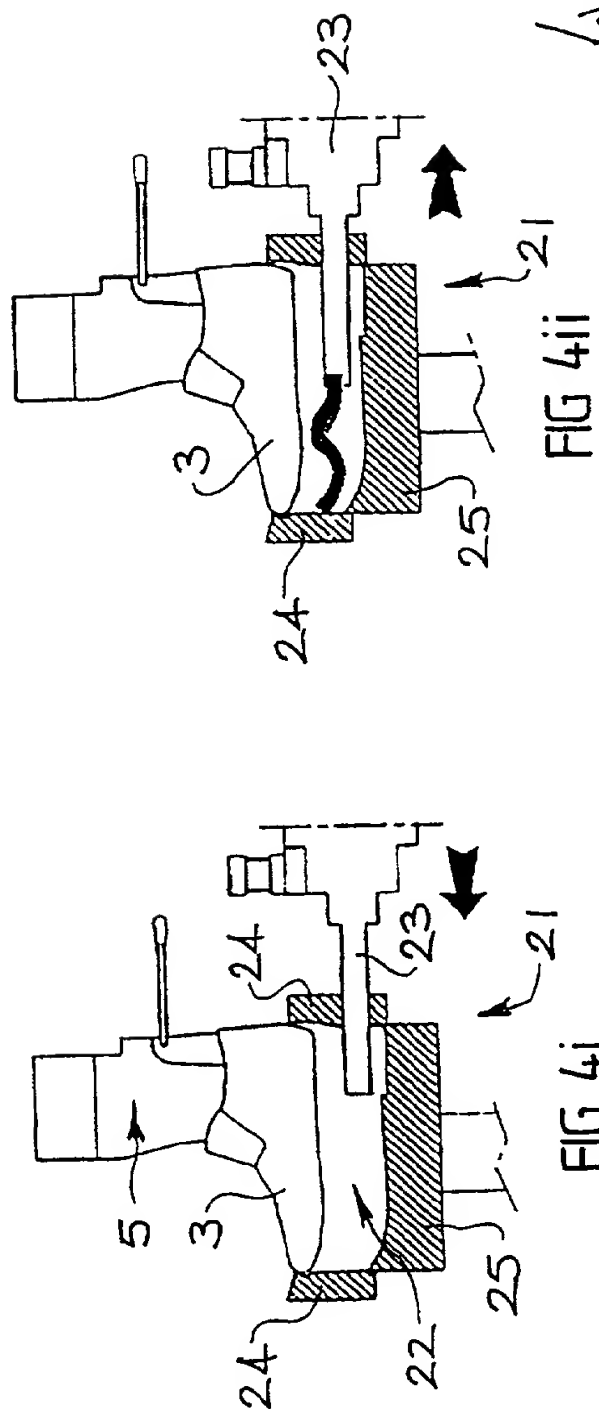


FIG 5

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

MANUFACTURE OF FOOTWEAR

the specification of which was filed in the U.S. Patent Office on June 20, 2000 under U.S. Serial No. 09/581,978.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign PCT Application(s) and any priority claims under 35 U.S.C. §119:			Priority Claimed	
PP1053 (Number)	Australia (Country if PCT so indicate)	22 December 1997 (DD/MM/YY Filed)	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
PF5317 (Number)	Australia (Country)	19 August 1998 (DD/MM/YY Filed)	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
PCT/AU98/01070 (Number)	PCT (Country)	22 December 1998 (DD/MM/YY Filed)	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(filing date)	(status-patented, pending, abandoned)
(Application Serial No.)	(filing date)	(status-patented, pending, abandoned)

PCT Applications designating the United States:

(PCT Appl. No.)	(U.S. Ser. No.)	(PCT filing date)	(status-patented, pending, abandoned)
(PCT Appl. No.)	(U.S. Ser. No.)	(PCT filing date)	(status-patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

2
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Norman William MacLeod
Inventor's signature

1-8-2006
Date

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AUX

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Full name of second or joint inventor:
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Residence:
Post Office Address:

Date

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